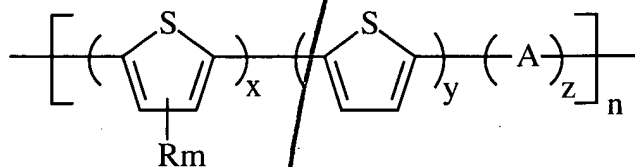


WHAT IS CLAIMED IS:

1. An electronic device containing a polythiophene



(I)

wherein R represents a side chain, m represents the number of R substituents; A is a divalent linkage; x, y and z represent, respectively, the number of R<sub>m</sub> substituted thienylenes, unsubstituted thienylenes, and divalent linkages A in the monomer segment subject to z being 0 or 1, and n represents the number of repeating monomer segments in the polymer or the degree of polymerization.

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2. A device in accordance with **claim 1** and which device is a thin film transistor (TFT) comprised of a substrate, a gate electrode, a gate dielectric layer, a source electrode and a drain electrode, and in contact with the source/drain electrodes and the gate dielectric layer a semiconductor layer comprised of said polythiophene wherein R is alkoxyalkyl, siloxy-substituted alkyl, a perhaloalkyl, or a polyether; A is a divalent linkage selected from the group consisting of arylene of about 6 to about 40 carbon atoms; m is 1 or 2; x and y are the number of the R substituted thienylenes and the unsubstituted thienylene moieties, respectively, each of which are from 1 to 5; z is zero or 1, and represents the number of divalent linkages; and n represents the number of monomer segments.

3. A device in accordance with **claim 1** wherein n is from about 5 to about 5,000; the number average molecular weight ( $M_n$ ) of the polythiophene is from about 2,000 to about 100,000; the weight average molecular weight ( $M_w$ ) is from about 4,000 to over 500,000, both  $M_w$  and  $M_n$  being measured by gel permeation chromatography using polystyrene standards.

4. A device in accordance with **claim 1** wherein R is alkyl containing from 1 to about 20 carbon atoms, and wherein n is from about 10 to about 1,000; the  $M_n$  is from about 4,000 to about 50,000; and the  $M_w$  is from about 5,000 to about 100,000.

5. A device in accordance with **claim 1** wherein the alkyl side chain R contains from 6 to about 12 carbon atoms.

6. A device in accordance with **claim 1** wherein the alkyl side chain R is butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, or dodecyl.

7. A device in accordance with **claim 1** wherein the side chain R is a perfluoroalkyl of about 2 to about 15 carbon atoms.

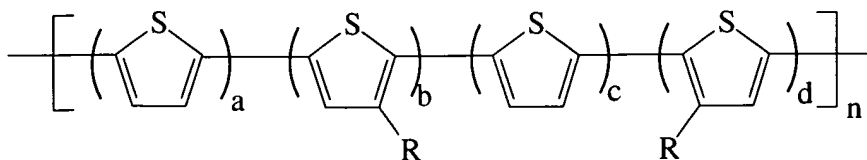
8. A device in accordance with **claim 1** wherein the side chain R is a siloxyalkyl of trimethylsiloxyalkyl, triethylsiloxyalkyl, and wherein alkyl optionally contains from about 4 to about 10 carbon, and which alkyl is butyl, pentyl, hexyl, heptyl, or octyl.

9. A device in accordance with **claim 1** wherein the divalent linkage A is an arylene with from about 6 to about 40 carbon atoms.

10. A device in accordance with **claim 9** wherein the divalent linkage A is selected from the group consisting of phenylene, biphenylene, phenanthrenylene, 9,10-dihydrophenanthrenylene, fluorenylene, methylene, polymethylene, dioxyalkylene, dioxyarylene, and oligoethylene oxide.

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11. A device in accordance with **claim 1** wherein said device is a thin film transistor and said polythiophene is represented by



(II)

wherein R is a side chain; a, b, c, and d represent the number of thienylene moieties; and n is the degree of polymerization.

12. A device in accordance with **claim 11** wherein R is alkyl containing from about 1 to about 20 carbon atoms.

13. A device in accordance with **claim 11** wherein R is alkyl containing from about 6 to about 12 carbon atoms.

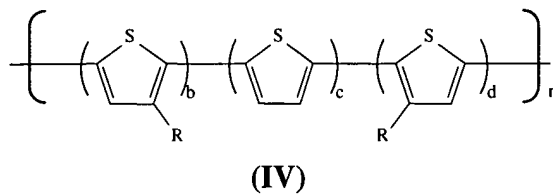
14. A device in accordance with **claim 11** wherein R is butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, or dodecyl.

15. A device in accordance with **claim 11** wherein b and d are from about 1 to about 5.

16. A device in accordance with **claim 11** wherein b and d are from about 1 to about 3.

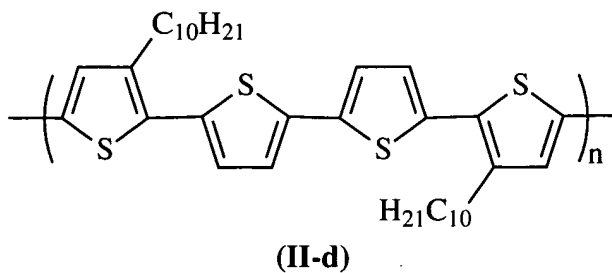
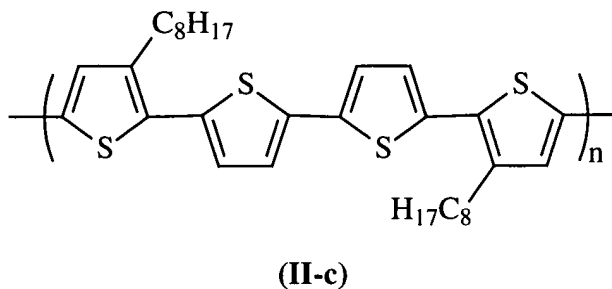
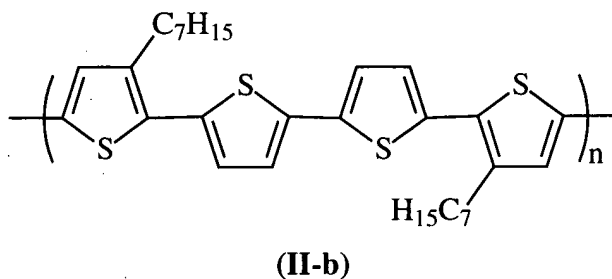
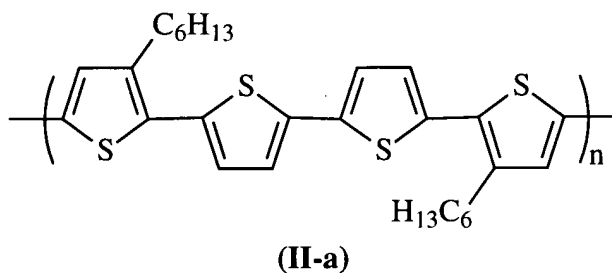
17. A device in accordance with **claim 11** wherein a is from about 0 to about 5, and c is about 1 to about 5, or wherein a is about 0 to about 3, and c is about 1 to about 3.

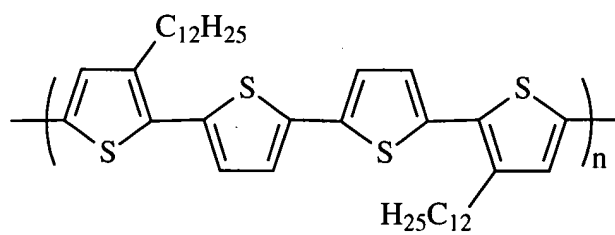
18. A device in accordance with **claim 11** wherein said device is a thin film transistor and said polythiophene is represented by Formula (IV)



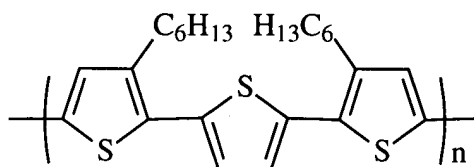
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19. A device in accordance with **claim 1** wherein said polythiophene is selected from the group consisting of polythiophenes (II-a) through (II-o)

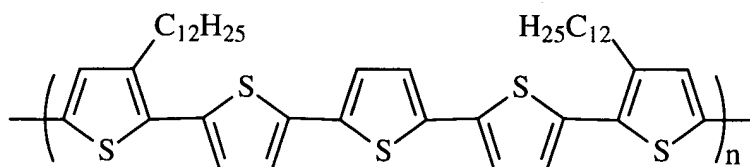




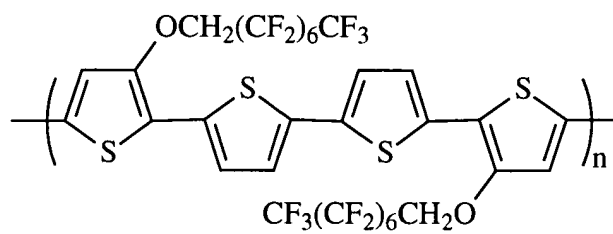
(II-e)



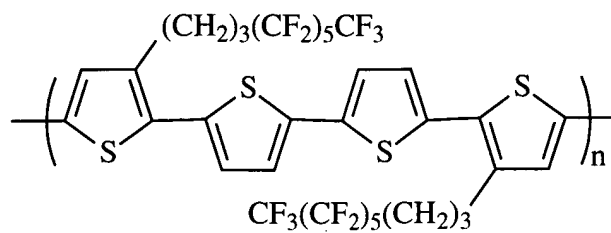
(II-f)



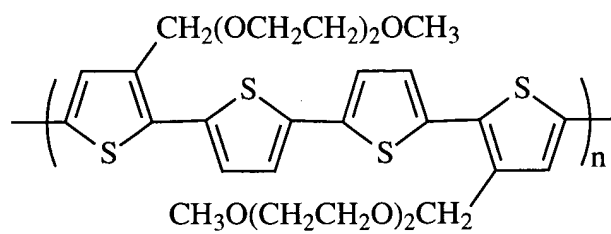
(II-g)



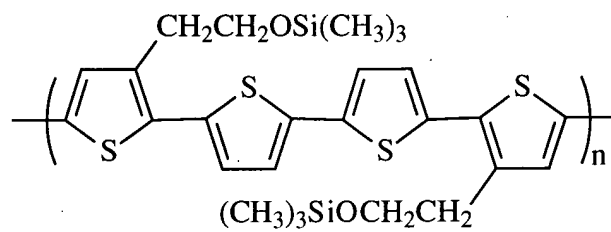
(II-h)



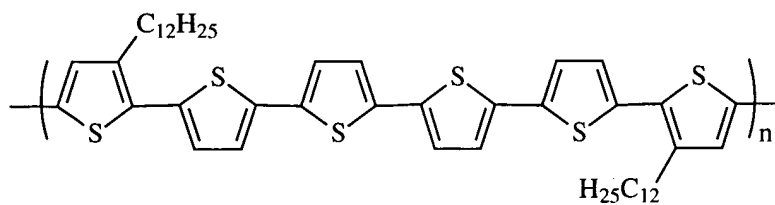
(II-i)



(II-j)

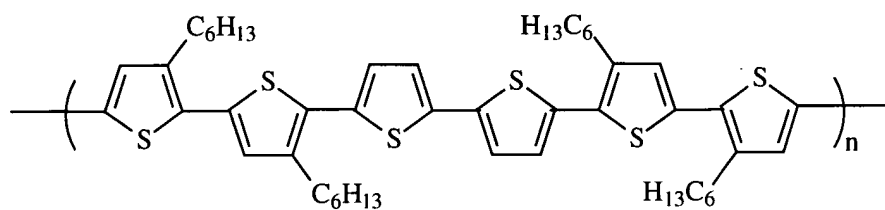


(II-k)

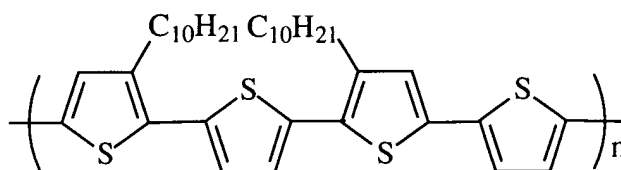


(II-l)

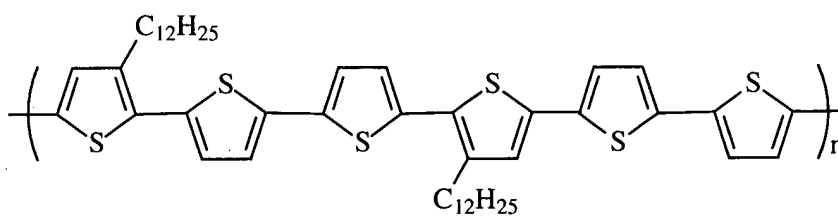




(II-m)

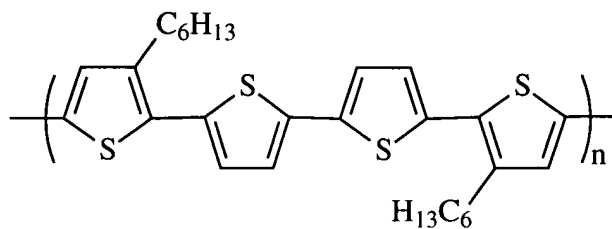


(II-n)

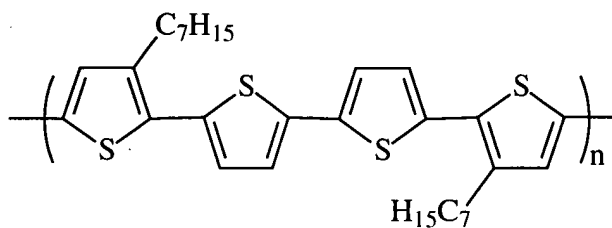


(II-o)

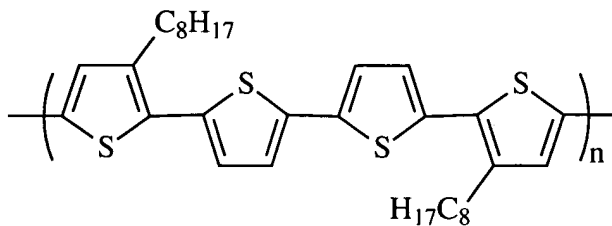
20. A device in accordance with **claim 1** wherein said device is a thin film transistor and said polythiophene is selected from the group consisting of (II-a) through (II-e)



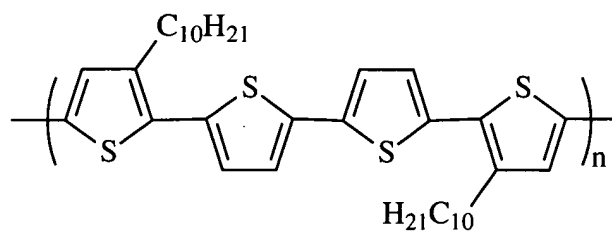
(II-a)



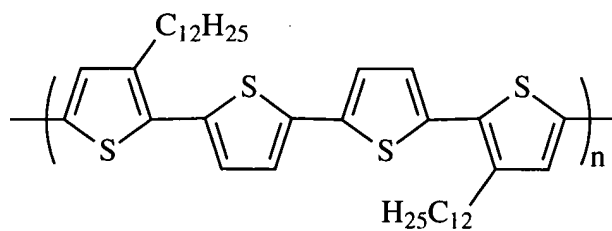
(II-b)



(II-c)



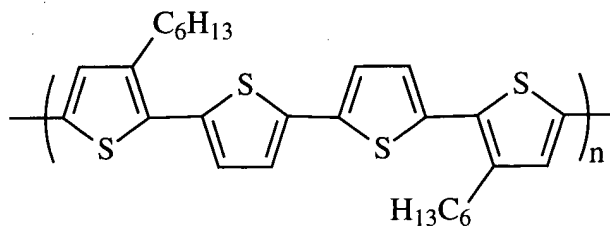
(II-d)



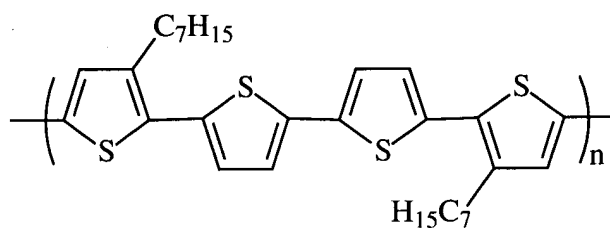
(II-e)

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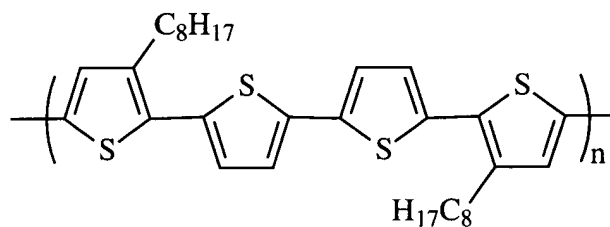
21. A device in accordance with **claim 11** wherein said device is a thin film transistor and said polythiophene is selected from the group consisting of (II-a) through (II-e)



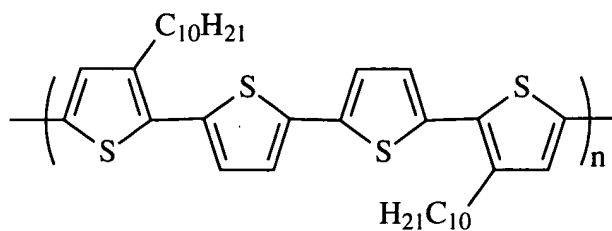
(II-a)



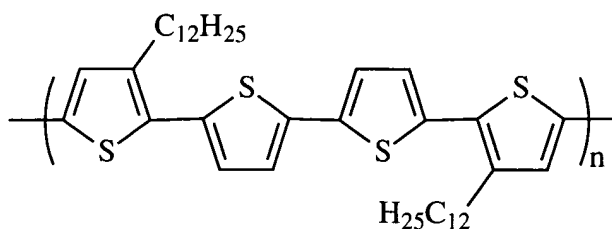
(II-b)



(II-c)



(II-d)



(II-e)

22. A device in accordance with **claim 1** wherein  $n$  is a number of from about 5 to about 5,000.

23. A device in accordance with **claim 2** wherein  $n$  is a number of from about 5 to about 5,000.

24. A device in accordance with **claim 11** wherein  $n$  is a number of from about 5 to about 5,000.

25. A device in accordance with **claim 1** wherein  $R$  is hexyl, heptyl, octyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, or pentadecyl; and  $m = 1$ ,  $x = y = 2$ ,  $z = 0$  or  $1$ .

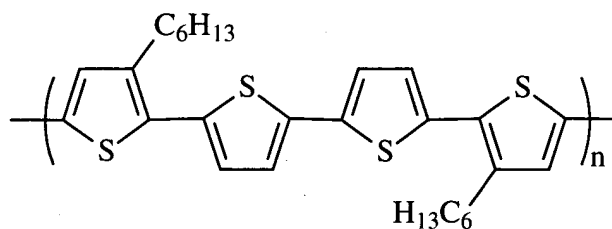
26. A device in accordance with **claim 2** wherein  $R$  is hexyl, heptyl, octyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, or pentadecyl; and  $m = 1$ ,  $x = y = 2$ , and  $z = 0$  or  $1$ .

27. A device in accordance with **claim 1** wherein said polythiophene possesses a  $M_n$  of from about 2,000 to about 100,000, and a  $M_w$  of from about 4,000 to about 500,000.

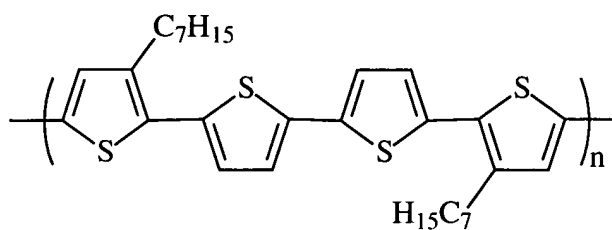
28. A device in accordance with **claim 11** wherein said polythiophene possesses a  $M_n$  of from about 2,000 to about 100,000, and a  $M_w$  of from about 4,000 to about 1,000,000.

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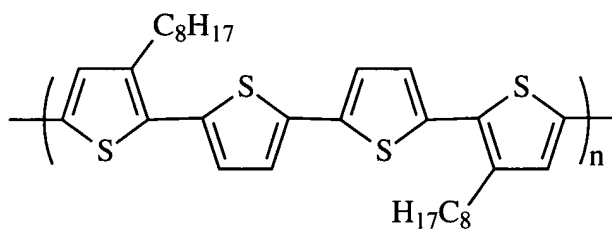
29. A device in accordance with **claim 28** wherein said polythiophene is selected from the group consisting of (II-a) through Formula (II-e)



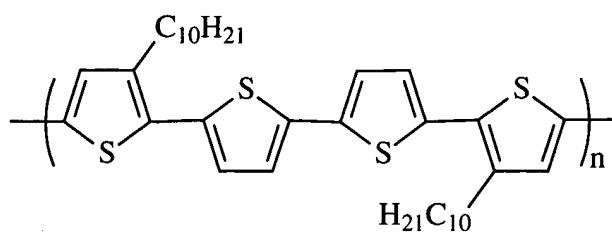
(II-a)



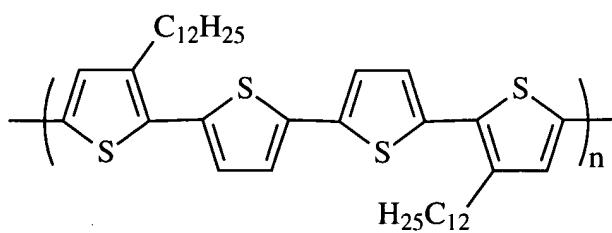
(II-b)



(II-c)



(II-d)



(II-e)



30. A device in accordance with **claim 2** wherein said substrate is a plastic sheet of a polyester, a polycarbonate, or a polyimide; said gate source and drain electrodes are each independently comprised of gold, nickel, aluminum, platinum, indium titanium oxide, or a conductive polymer, and said gate is a dielectric layer comprised of silicon nitride or silicon oxide.

31. A device in accordance with **claim 2** wherein said substrate is glass or a plastic sheet; said gate, source and drain electrodes are each comprised of gold, and said gate dielectric layer is comprised of the organic polymer poly(methacrylate), or poly(vinyl phenol).

32. A device in accordance with **claim 1** wherein said polythiophene layer is formed by solution processes of spin coating, stamp printing, screen printing, or jet printing.

33. A device in accordance with **claim 2** wherein said gate, source and drain electrodes, said gate dielectric, and semiconductor layers are formed by solution processes of spin coating, solution casting, stamp printing, screen printing, or jet printing.

34. A device in accordance with **claim 2** wherein the substrate is a plastic sheet of a polyester, a polycarbonate, or a polyimide, and the gate, source and drain electrodes are fabricated from the organic conductive polymer polystyrene sulfonate-doped poly(3,4-ethylene dioxythiophene) or from a conductive ink/paste compound of a colloidal dispersion of silver in a polymer binder, and the gate dielectric layer is organic polymer or inorganic oxide particle-polymer composite.

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